Baryon Stopping and Charged Particle Distributions in Central Pb+Pb Collisions at 158 GeV per Nucleon

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Net proton and negative hadron spectra for central Pb+Pb collisions at 158 GeV per nucleon at the CERN SPS were measured [1] and compared to spectra from lighter systems.

Fig. 1 shows rapidity distributions of net protons $p-\bar{p}$ and net baryons $B-\bar{B}$. The points are corrected for protons from Λ decay using the model based $\Lambda-\bar{\Lambda}$ distribution shown as a solid line. The result from using two other $\Lambda-\bar{\Lambda}$ distributions from model and preliminary measurement are also shown. The $p-\bar{p}$ from Pb+Pb differs dramatically from that of $p+p$ collisions at 400 GeV/c [2], which have been scaled up to match the integrated yield of the heavy-ion data. Net baryons are calculated through combining $p-\bar{p}$ and $\Lambda-\bar{\Lambda}$ with model calculations of isospin contributions and other strange baryon contributions. Net baryons are less sensitive to the uncertainty of $\Lambda-\bar{\Lambda}$ than the net protons are because the contributions from Λ decay correction and strange baryons nearly offset each other. Shown with the net baryons from Pb+Pb collisions are the net baryons from central S+S collisions [3] that are scaled by the ratio of participating nucleons in the two systems. Stopping (rapidity shift with respect to the beam) of the net baryons increases with system size.

Not shown is the rapidity density of negative hadrons h^-, which scales with the number of participant nucleons for nuclear collisions.

The mean transverse momentum $\langle p_T \rangle$ of h^- at midrapidity remains the same for the Pb+Pb and S+S collision data, whereas the $\langle p_T \rangle$ of $p-\bar{p}$ increases. In both cases, the $\langle p_T \rangle$ of $p-\bar{p}$ is greater than that of h^-. This $\langle p_T \rangle$ dependence upon particle mass and system size is consistent with larger transverse flow velocity [4] at midrapidity for central collisions of Pb+Pb compared to S+S.

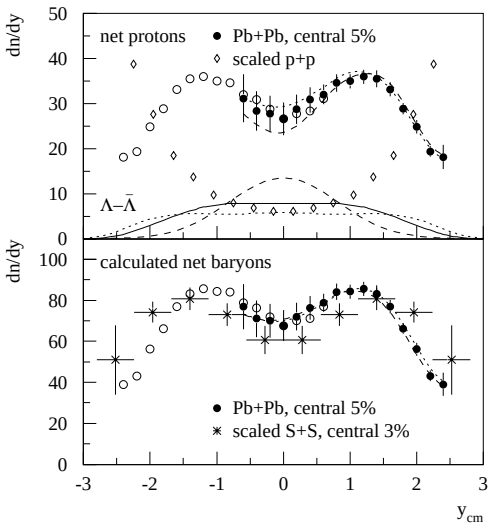

Figure 1: Upper: normalized rapidity distributions of p–$\bar{p}$ for Pb+Pb collisions (open circles are data reflected about $y_{cm} = 0$, errors not shown). Also shown is the scaled proton distribution for p+p collisions. Lower: normalized rapidity distributions of $B-\bar{B}$ calculated from $p-\bar{p}$ and $\Lambda-\bar{\Lambda}$ distributions along with scaled $B-\bar{B}$ for S+S collisions.

References

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[3] T. Alber *et al.*, Eur. J. Phys. C **2**, 643 (1998).

[4] H. Appelshäuser *et al.*, Eur. J. Phys. C **2**, 661 (1998).